Pothole Classification Using CNNs

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Introduction

- Potholes can cause misalignment of the vehicles from intended path & damage vehicle structure which can lead to accidents.
- With employment of autonomous vehicles in passenger travel, the accurate detection is important for taking evasive measures.
- This study focuses on using convolutional neural networks to come up with a robust model to classify pothole images and suggest some unprecedented applications. The borrowed dataset used consists of images taken in South Africa.

Problem

- Given an image of the road, identify if the image contains potholes or not.
- Compare the performance of ResNet18 and GoogLeNet on the given dataset.

Dataset

- Original Data
  - High resolution images of size 3680 x 2760
  - 1958 images with potholes
  - 9289 images without potholes

Discussion

<table>
<thead>
<tr>
<th></th>
<th>Precision</th>
<th>Recall</th>
<th>F1 Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ResNet18</td>
<td>0.9646</td>
<td>0.9657</td>
<td>0.9651</td>
</tr>
<tr>
<td>GoogLeNet</td>
<td>0.9732</td>
<td>0.9735</td>
<td>0.9734</td>
</tr>
</tbody>
</table>

- The weighted, to account for data-imbalance, cross entropy loss gave poorer performance, observed from the matrix on the right compared to the left.
- In all, GoogLeNet gave better results across all the metrics as shown in the table.

Future Work

- Experimenting with more architectures, or even building one from scratch.
- Collect more varied data which not so much co-related as this dataset.

SciVerse.com: 1.1.2.3

Notable References
